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THE DENSITY OF OYSTERS AND SHELL UPRIVER FROM THE CAMPOSTELLA BRIDGE IN THE ELIZABETH RIVER

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by

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Introduction

This study estimates the density of oysters and oyster shells on that portion of the J. H. Miles Co. lease which lies within 450 feet of the upriver edge of the Campostella Bridge.

The Campostella Bridge is located on Route 460 on the Eastern Branch of the Elizabeth River (Figure 1). The area is restricted for shellfish culture by the Virginia State Health Department and salinities are high enough to favor the development of the oyster diseases Haplosporidium costalis (MSX) and Perkinsus marinum (Dermo). Because a combination of the effects of pollution and disease, the area has not produced commercial volumes of oysters for many years; probably since 1960.

The site of the study is shown in Figure 1. The oyster lease surveyed is shown in Figure 2 as plat 3915 (leased by J. H. Miles Co.).

The bounds of the survey area as well as the extent of the lease were established just prior to our study by personnel of the Virginia Marine Resources Commission (VMRC).

Methods

After the study area was staked out by the VMRC, stations were located 50 feet apart on transects (Figure 3). These stations were located in reference to the VMRC stakes; distances were measured using a floating rope calibrated in feet.

At each station quantitative samples of oysters and shells were collected by an experienced waterman using shaft tongs.[1] The material collected in each tong was examined and the following data were recorded.

1. Number and size of large and small oysters, and spat (1982 year class);
2. Volume of surface and buried shells;
3. Number of dead oysters (boxes);
4. Type of bottom (mud, sand, shell, etc.); and
5. Water depths.

Results

Bottom Type

The study area upriver from the Campostella Bridge varied in depth from 8 to 14 feet with a mean depth of 10.8 feet. The bottom was composed of mud and shell. Buried and surface shell formed a crust on over 61% of the bottom.

Sixteen stations, or 29%, had no oysters or shell (these stations are enclosed in dotted lines in Figure 3). On these sixteen stations the substrate varied from very soft to a firm mud. Occasionally a few oysters were found without a supporting crust of shells.

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[1] The heads of the tongs were tied with a rope so the teeth covered about 4.42 ft^2 of bottom.

Oyster Size

The mean size of market oysters was 94.5 mm (3.8 in.) in length. The average count (number) per bushel was 324 oysters of all sizes. Fifty-five per cent of the oysters were market size (3 inches or longer). In a Virginia bushel of bottom material, six-tenths of the volume was shell and four-tenths was oysters. The oysters were relatively clean with a few mussels or barnacles; a few worm tubes were observed on the oysters.

Area Covered by Tongs

The opening of the tongs was standardized by tying the tongs with a rope. The resultant grab sampled 4.42 square feet each grab. Assuming 43560 $feet^2$ per acre and a total area sampled of 243.1 $feet^2$ (55 stations x 4.42 ft^2 per grab) the total oysters per acre was calculated. This was converted to bushels per acre using a bushel count of 324 oysters. Assuming that 0.6 of each bushel caught in the samples was shell, and the same relationships between total area sampled and the total area of an acre, we can calculate the numbers of bushels of shell per acre.

Volume of Shells and Oysters Per Acre

The 90,000 sq. ft covered by our survey (450 x 200) contained about 155.4 bushels of oysters and about 222.1 bushels of shells. Each acre on the survey area supported about 24369. oysters or 75.2 bushels of oysters per acre. Also, on each acre there was 107.5 bushels of shell (Table 2).

Mortality

Mortalities in the area were high (27.5%) as evidenced by the number of boxes. These could be expected in this old population of oysters in an MSX area. None of the deaths were recent. Sixty-nine per cent of the shells was buried and thirty-one per cent of the shell was on the surface. There were no spat in the sample.

Conclusion

This area was an active lease probably prior to 1960, when MSX was not a problem. The oysters existing here today are the result of natural production, on very limited quantities of surface shell.

The area surveyed contained about 155.4 bushels of oysters and 222.1 bushels of shell. Their maximum value today is about:

155.4 x 6.00	=	$932.40
222.1 x .38	=	84.40
Total		$1016.80

Table 1. Field results of tonged samples collected along transects shown in Figure 1. Data collected on May 19 and 20, 1983 in the Elizabeth River just upriver from the Campostella Bridge. Data shows number of oysters, spat and boxes per tong.

	Market Oysters	Small Oysters	Spat	Market Boxes	Small Boxes	% of Shell Buried	% of Shell Surface	Remarks
Transect 1								
Station 1	3	2	0	1	0	50	50	7 shells 10 1/2 ft oyster shells, rocks
Station 2	0	2	0	0	0	100		8 shells mud, shell
Station 3	6	1	0	1	1	20	80	7 shells mud, shell
Station 4	0	0	0	0	0	100		2 shells mud
Station 5	0	0	0	0	0			soft mud 9 1/2 ft
Transect 2								
Station 1	0	0	0	0	0			soft mud
Station 2	6	3	0	2	0	50	50	10 shells
Station 3	0	0	0	0	0			soft mud
Station 4	3	2	0	2	0	100		10 shells
Station 5	6	0	0	4	0	20	80	12 shells mud, shell
Transect 3								
Station 1	5	4	0	4	0	30	70	14 shells
Station 2	0	0	0	0	0	100		4 shells mud, shell
Station 3	0	2	0	1	0	100		8 shells mud, shell
Station 4	2	3	0	1	1	100		10 shells mud, shell
Station 5	2	0	0	0	0	100		2 shells
Transect 4								
Station 1	0	0	0	1	0	100		6 shells mud, shell
Station 2	0	0	0	0	0			soft mud
Station 3	4	0	0	2	0	100		4 shells
Station 4	0	0	0	0	0			mud
Station 5	3	3	0	0	0	20	80	13 shells 3 qts. of shells & fragments

Table 1. (continued)

	Market Oysters	Small Oysters	Spat	Market Boxes	Small Boxes	% of Shell Buried	% of Shell Surface	Remarks	
Transect 5									
Station 1	0	0	0	0	0			mud	
Station 2	4	1	0	0	0	100		1 shell mud, shell	
Station 3	0	0	0	0	0			mud	
Station 4	1	2	0	4	0	100		7 shells mud, shell	
Station 5	1	2	0	0	0	0	0		8 ft
Transect 5a (25 ft from 5 and 6)									
Station 1	0	0	0	0	0			mud	9 ft
Station 2	1	2	0	5	0		100	4 shells	
Station 3	0	6	0	0	0	100		1 shell	
Station 4	3	1	0	3	0	100		3 shells	
Station 5	3	2	0	0	0	100		2 shells mud	11 ft
Transect 6									
Station 1	1	3	0	2	0	50	50	20 shells	10 1/2 ft
Station 2	0	0	0	0	0			mud	10 ft
Station 3	1	3	0	4	0	100		5 shells	
Station 4	0	0	0	0	0			mud	10 ft
Station 5	0	0	0	0	0			mud	10 ft
Transect 7									
Station 1	0	0	0	0	0			mud	
Station 2	0	0	0	0	0		100	2 shells	
Station 3	0	0	0	0	0			mud	10 1/2 ft
Station 4	2	3	0	0	0		100	3 shells	
Station 5	0	0	0	0	0			mud	11 ft
Transect 8									
Station 1	0	4	0	0	0	100		2 shells	11 ft
Station 2	0	0	0	0	0			mud	
Station 3	2	0	0	4	0		100	4 shells	
Station 4	0	0	0	0	1		100	5 shells	
Station 5	2	2	0	4	0	100		4 shells	
Transect 9									
Station 1	0	2	0	0	0	100		2 shells	14 ft
Station 2	1	0	0	0	0			fragments	13 ft
Station 3	0	0	0	0	0			buried frags.	13 ft
Station 4	0	2	0	0	3	100		2 shells	10 ft
Station 5	0	0	0	0	0			mud	10 ft

Table 1. (continued)

	Market Oysters	Small Oysters	Spat	Market Boxes	Small Boxes	% of Shell Buried	% of Shell Surface	Remarks
Transect 10								
Station 1	2	1	0	2	0	100		shell, oysters 13 ft mud
Station 2	1	4	0	0	0	100		mud, shell 13 ft
Station 3	0	1	0	1	0	100		mud, shell 13 ft
Station 4	0	0	0	0	0			mud 10 ft
Station 5	0	0	0	0	0			mud 8 1/2 ft
Totals	65	63	0	48	6			

93 shells = 10 qts. in volume
Total shells = 30 qts.
Total oysters = 21 qts.
Tongs Tied on 24 inch; basket is 26 1/2 inches wide = 4.42 ft^2
Number of samples = 55
Collections had a light set of mussels and worm tubes on them.

Table 2. Basic Data Used in Estimating Densities (from Table 1).

1.	Total number of tonged samples	55	
2.	Total area of bottom sampled each grab	4.42	ft^2
3.	Total number market oysters collected[2]	75	
	Total number small oysters collected[2]	61	
	Total	136	
4.	Total volume of shells collected	30	qts. (0.6 bu)
5.	Number of large and small oysters in a bushel	324	

Method of Calculating Bushels of Oysters and Shells Per Acre

1. There are 43,560 ft^2 in 1 acre; and our 55 samples covered 243.1 ft^2 (55 x 4.42)

2. Therefore, number of oysters/acre = 55 x 4.42 ft^2 = 243.1 ft^2
   43560 ÷ 243.1 x 136 = 24369.2 oysters

3. Bushels of oysters/acre = 24369.2 ÷ 324 = 75.2 bushels of oysters/acre

4. Bushels of shell/acre = 43560 ÷ 243.1 x 0.6 bu = 107.5 bushels of shell per acre

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[2] These are corrected totals; they do not agree with those showing overall distribution (Table 2).

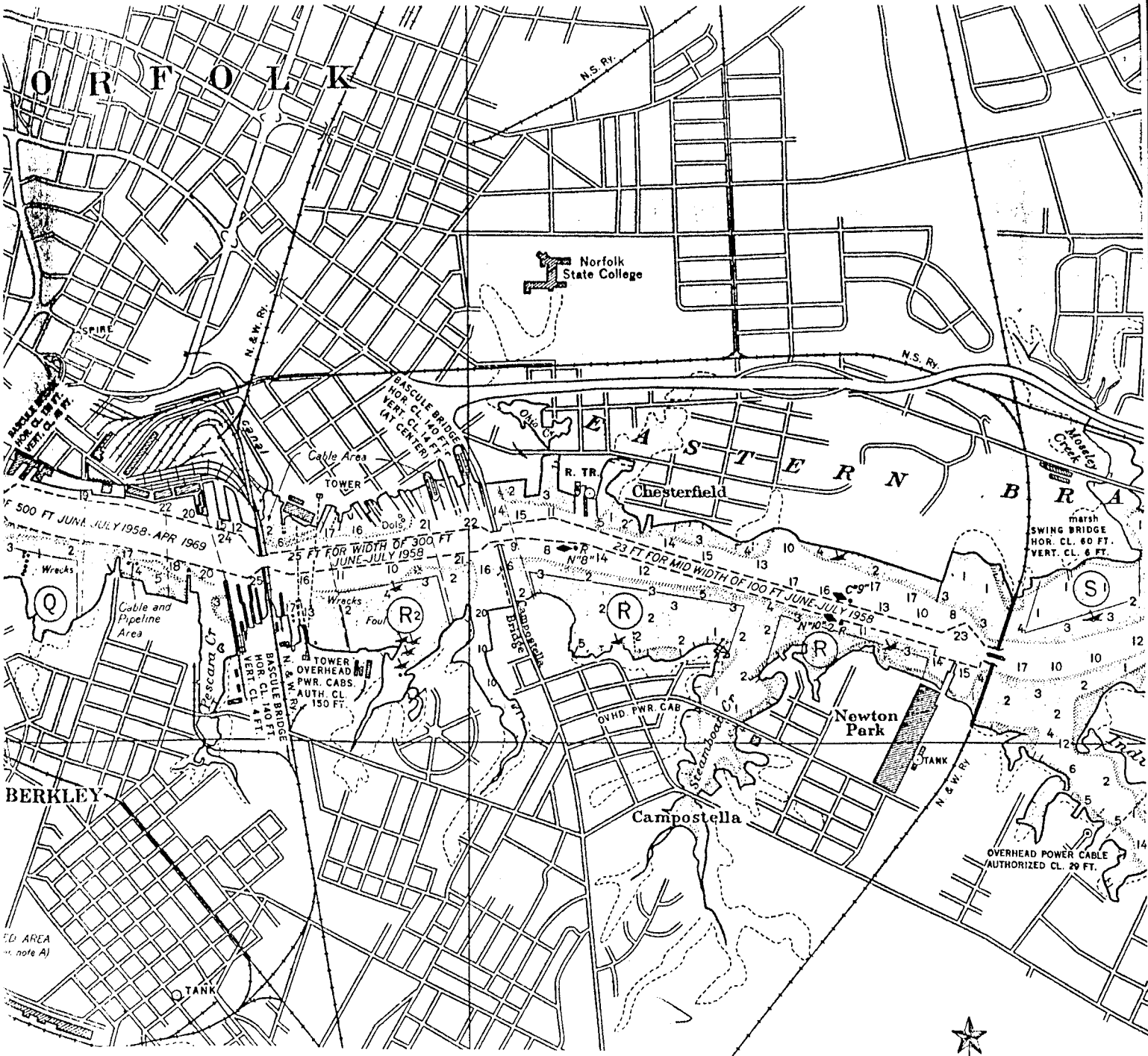

Figure 1. Location of Campostella Bridge in the Elizabeth River System.

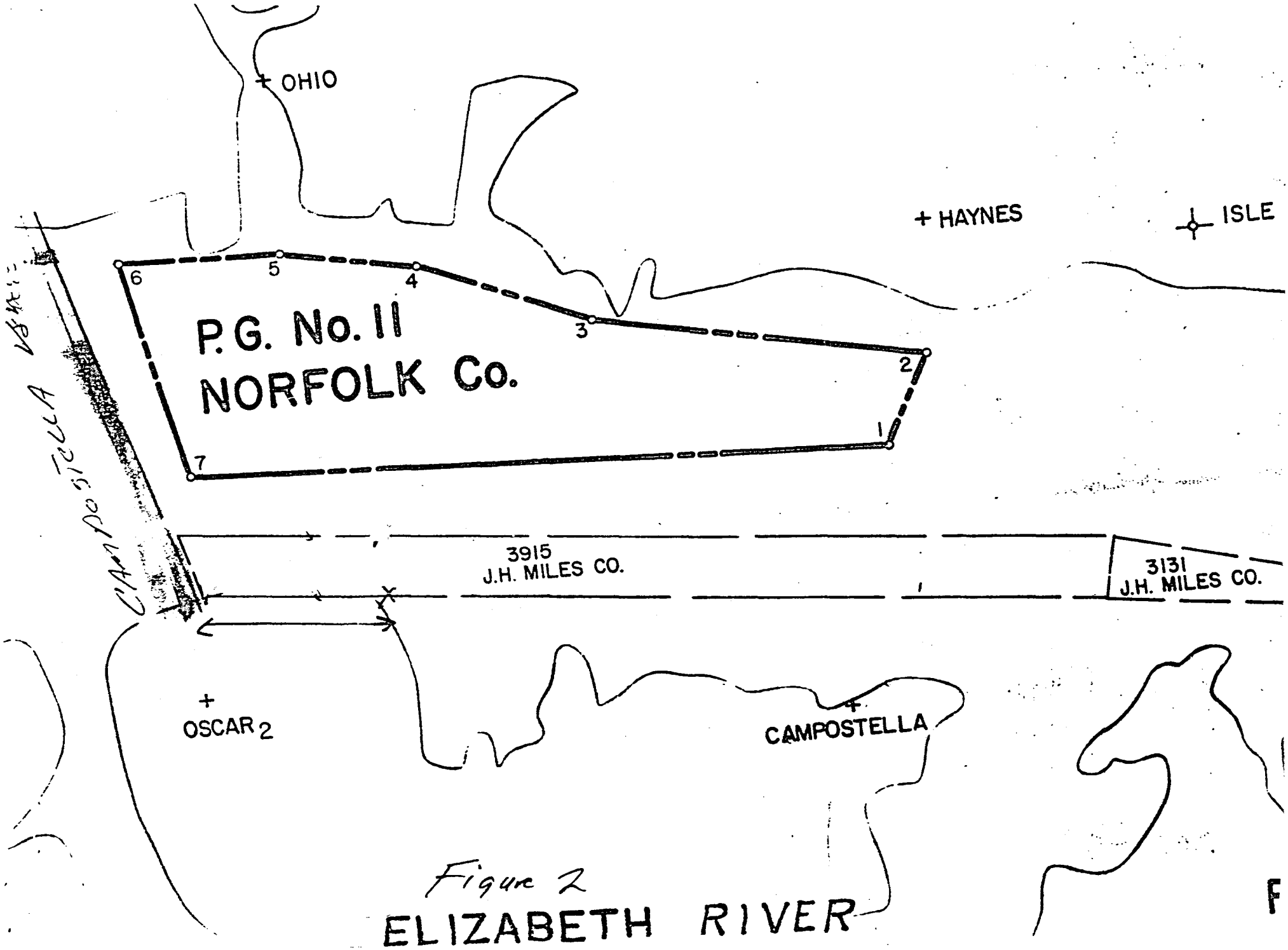
OHIO
HAYNES
ISLE
6
5
4
3
2
1
7
P.G. No. 11
NORFOLK Co.
CHANNEL
3915
J.H. MILES CO.
3131
J.H. MILES CO.
OSCAR 2
CAMPOSTELLA
ELIZABETH RIVER

Figure 2

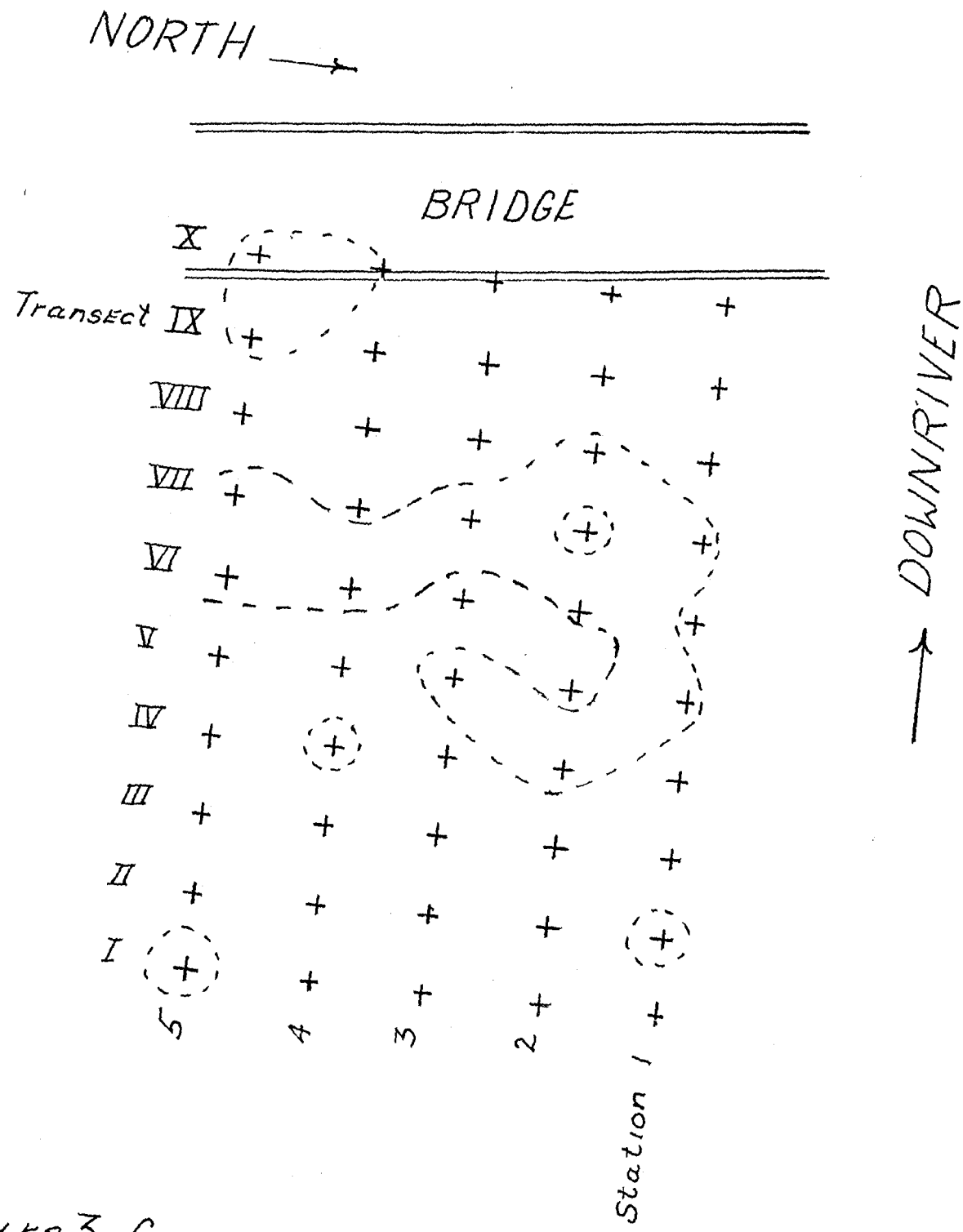

Figure 3. Campostella Bridge station locations. Transects and stations are fifty feet apart. Mud areas are enclosed by dotted lines.